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IOT Monitored Brushless DC Motor Speed Control Using Arduino

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Abstract*— *Brushless Direct Current motors are extensively used in many of the industries because of its low cost, high speed torque characteristics, noise less operation. Speed controlling is Very important. By using the Arduino Board interfaced with the Electronic Speed controller, Motor speed can be is controlled by varying the 10k pot. The parameters like Speed, Current and Voltage are Monitored on the LCD and the same parameters are monitored from remote access through the configured electronic gazettes by using the Internet Of things.

Keywords*— *ESC, IOT, LCD, DC motor.

I. INTRODUCTION

Brush less DC motors are excited with Permanent magnet are pretty largely used in a huge amount of applications because of decent performance profits like higher torque current ratio, less noise, more efficient, small size and inexpensive, lesser torque ripples, lesser supervision and well control characteristics on a huge range in torque speed period. Brushless DC motors which are used in ceiling fans are reduced in size and heaviness than AC fans which has Universal motors. As these motors have the capacity to work with the small supply source voltages.Commutation process of a Brushless DC motor in controlled by Electronic speed controller(ESC). ESC will energizes the stator windings and in a proper sequence ,which supports to rotate the Brushless DC motor. Brushless Direct Current motor speed can be controlled and other parameters are monitored on LCD display and on the registered android cell phones or tablet with the usage of Internet Of Things(IOT) technology. IOT is very helpful in industrial automation through remote access and also to monitor the different parameters.

II. BLOCK DIAGARAM

Hardware Consits of the following are

1. Microcontroller (Arduino Board)
2. Electronic Speed Controller
3. IOT Device
4. LCD Display
5. Power Supply
6. Sensors
7. BLDC Motor
8. 10k Pot

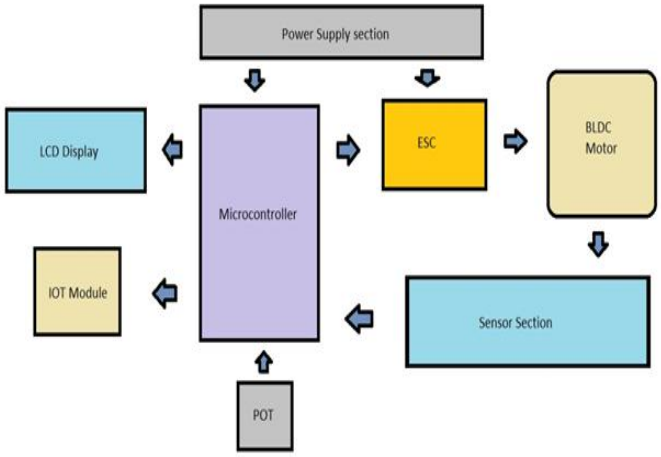

Fig. 1 Block diagram of the Proposed System

Arduino and ESC are two the main parts of the hardware, Arduino board is loaded with program written in embedded C language. When Supply of 12v is applied and by varying the 10K pot Arduino generates the PWM signals and depending the pulse width duration ESC will drive the Motor. As soon as ESC receives the pulses from Arduino it will energize the Phase wires of Brushless DC motor and motor starts rotating. Speed controlling of the Brushless DC motor is done by ESC. Sensors are used to sense the

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different parameters like speed, current and voltage of the Brushless DC motor.IR sensor acts as a digital tachometer and measures the rotation of the speed in RPM. Rotation of the speed and other parameters can be visualized in the LCD display. The same output will be monitored on the IOT configured device.

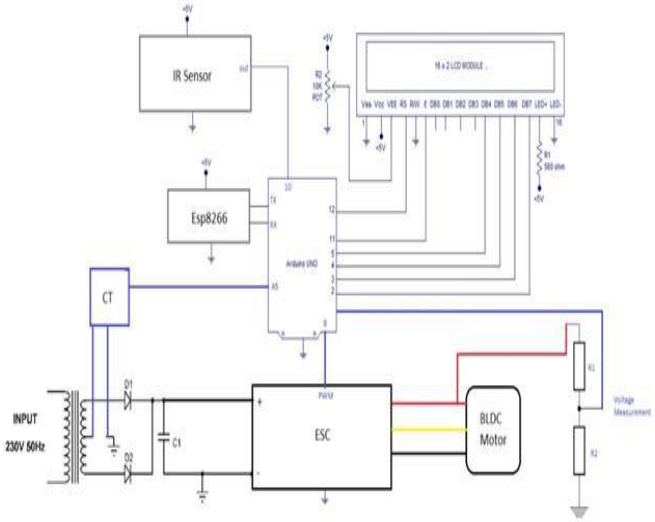

Fig.2 Functional diagram of proposed System

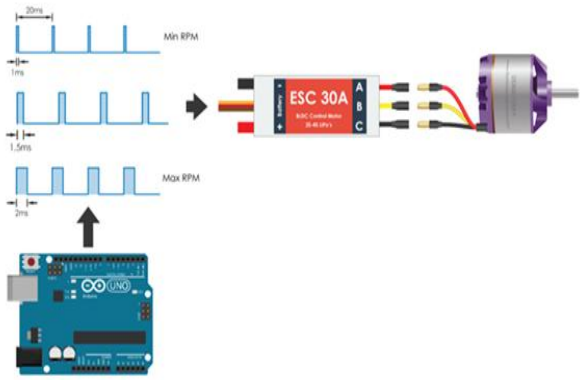

Fig.3 Arduino Board generating pulses to drive motor through ESC

III. FLOW CHART

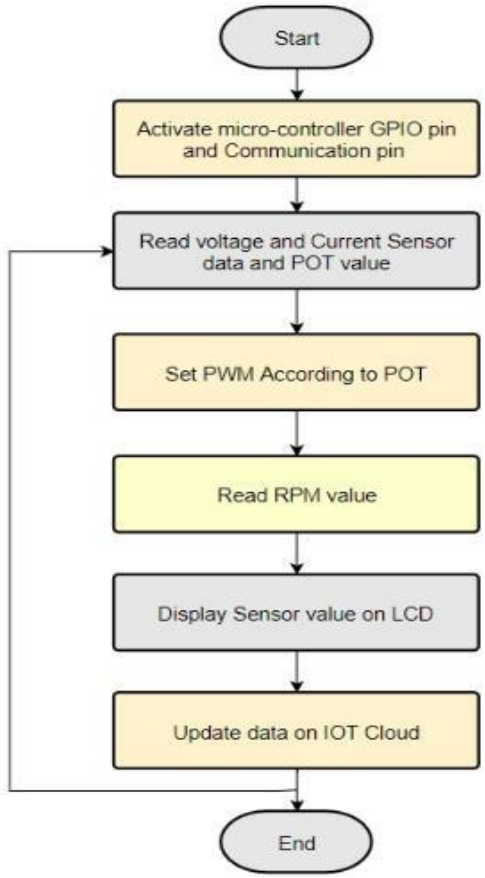

Fig. 4 Flow chart of the Proposed System

IV. HARDWARE ASSEMBLY

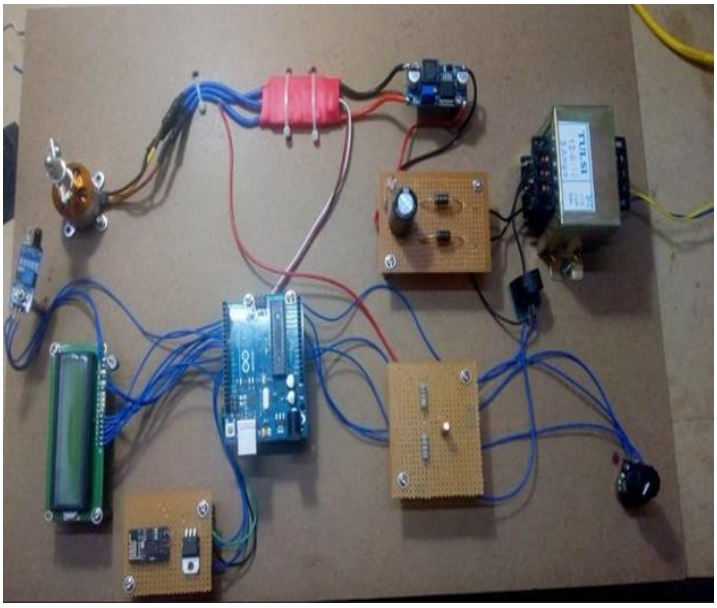

Fig.5 Harware Assembly of proposed System

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V. RESULT AND DISCUSSION

Brushless Direct current motor speed control is operated using the PWM system. The period of operation controls the output of the motor. By modifying the duty cycle, the appropriate pace can be identified. The modulation of the duty cycle of the direct current motor is used to manage the pulsed width

Average voltage = D * Vin

The average voltage achieved in a number of operating cycles is specified, while the voltage supply decreases with the duty cycle percentage, which decreases the average voltage.

Duty Cycle = 100% x Pulse Width/Period

Where,

Duty Cycle in (%)

Pulse Width = Time period the signal is in the ON or high state (sec)

Period = Time of one cycle (sec).

The operating cycle regulates the speed of the Brushless Direct current engine. Different duty cycles can detect the required speed. The Arduino uno Pulse Width Modulation can be used to monitor the Brushless Direct Current motor working period to effectively adjust Brushless Direct Current motor rpm. Frequency and voltage can be displayed on the LCD16x2 Panel. The same parameters can be tracked from remote locations utilizing the IOT technology on installed computers. Speed for different voltages and current as seen in the table below.

Voltage in volts	Current in milliamps	Speed in RPM
7	362.48	10644
8	345.21	13193
9	310.69	16041

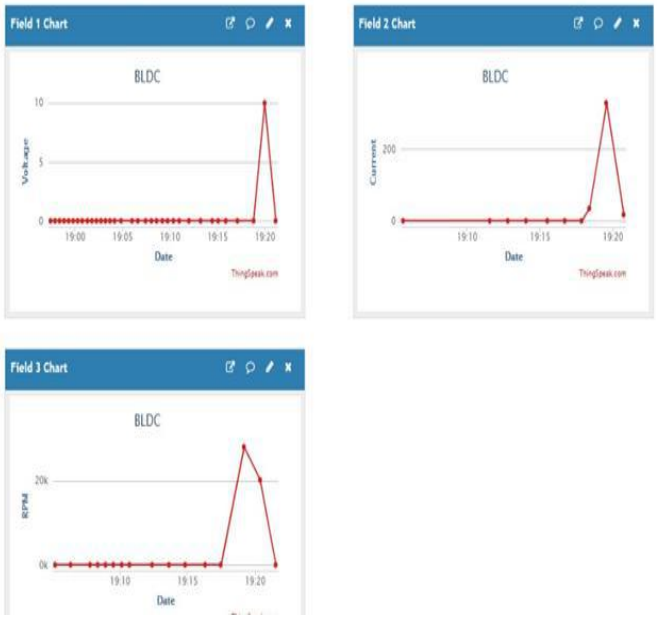

Fig. 6 Current, voltage and speed displayed on IOT application

Fig.7 Current, voltage and speed displayed on LCD

VI. CONCLUSION

Brushless Direct current motor speed is controlled successfully by using Electronic speed controller (ESC) and parameters can be monitored on a LCD display and as well as on the configured electronic gazettes. This

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proposed architecture uses the IOT technology in a web services for communication between remote user and source device. “Thingspeak” application can be launched in any browser using the credentials to monitor the parameters. This method of the proposed work provides a flexible and long distance connectivity between industrial environment and user. Speed of a Brushless Direct current motor is controlled successfully by using Electronic speed controller(ESC) and parameters can be monitored on a LCD display and as well as on the configured electronic gazettes.

VII. FUTURE SCOPE

Future we can implement Arduino wireless NRF communication in that, speed control is done by wireless technology.

Solar power can be used to run the Brushless Direct current motor.

We can add other sensors to monitor the other parameters like temperature, humidity near the motor etc.

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